

Impact of Combustion-Related Pollutants on the Development of Asthma

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The increased incidence of asthma over the last 30 years is a significant public health problem. The goals of this research, driven by the ORD's Asthma Research Strategy are to identify which combustion-related pollutants (CRPs) and CRP components may affect the incidence or severity of asthma and at what concentrations. Also, determination of the biological mechanisms for these effects will facilitate extrapolation to public scenarios.

Epidemiology has shown increased emergency room visits and medication use in asthmatics during air pollution episodes. Recent U.S. EPA human and animal studies have suggested that exposure to CRPs, such as diesel exhaust and ozone, can increase the incidence of asthma events in adults and children. The multidisciplinary research program includes exposure assessment, combustion engineering and chemistry, epidemiology, pulmonary medicine, laboratory animal science, mucosal immunology, airway physiology, and molecular biology. This research tests the hypothesis that environmental factors influence the induction and exacerbation of asthma and that these factors can be controlled. Epidemiology and exposure assessment studies provide information on types and concentrations of pollutants in the air, sources, and potential association with the incidence or severity of asthma. Clinical experiments and panel studies provide more specific information on personal exposures and susceptibility factors that may drive progression of the disease. Animal studies screen large numbers of exposure scenarios for hazard identification and quantitative risk assessment and explore biological mechanisms of the effects. Recent approaches in population studies are examining the relationship between asthma prevalence and exposure to vehicular exhaust. Ongoing clinical investigations are tracing single nucleotide polymorphisms in healthy and asthmatic individuals to identify genetic factors that influence asthma susceptibility and pathogenesis in response to inhaled pollutants. Current and future exposure studies in normal and transgenic animals are manipulating the chemistry of combustion atmospheres to find which components most affect asthmatic responses and are applying computational toxicology models to predict these effects in ambient air sheds.

The results of these studies directly feed into criteria documents and standard setting for various air pollutants. Also, the information is used by the Office of Air and Radiation and the Office of Transportation and Air Quality for risk assessment purposes. Most recently, the data has also served to develop new educational materials that support health messages for the Air Quality

Index (<http://www.airnow.gov/health-prof/>). Fundamental research on the development of asthma contributes to our understanding host and environmental risk factors for regulatory and outreach programs.

This abstract does not necessarily reflect U.S. EPA policy.